

REMARKS

Claims 19-34 and 47-50 are pending; claims 23-34 and 47-50 are rejected; and claims 19-22 are allowed in this application.

Responsive to the rejection of claims 23-34 and 47-50 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,985,073 (Kimura et al.) in view of U.S. Patent No. 2,887,964 (Griner), Applicants respectfully traverse the rejections and submit that claims 23-34 and 47-50 are in condition for allowance.

Kimura et al. disclose a method of manufacturing a cylindrical part from a fiber reinforced plastic composite material (Figs. 1-5). The method of manufacturing the thick walled cylindrical part includes utilizing a fiber reinforced plastic composite material layer that is heat cured. The carbon fiber reinforced composite material is laminated separately by several layers (column 3, lines 50-65). Fig. 1 shows a forming mandrel used for the method of forming a thick walled cylinder part by a fiber reinforced plastic composite material. Mandrel 1 is formed of a steel material and has a slight taper to facilitate removal of the cylindrical parts from mandrel 1 after heat curing. A carbon reinforced plastic composite material 2a is laid on the outer surface of mandrel 1 at an angle and with a radial thickness of several millimeters in such a way that the wall thickness can be changed so as to cancel the tapered surface on outer surface 1a of forming mandrel 1. The carbon fiber reinforced plastic composite material has a thermal expansion coefficient that differs according to the fiber direction of the carbon fiber reinforced plastic composite material. For instance, a carbon fiber reinforced plastic composite material has a thermal expansion coefficient in the fiber extending direction is almost zero due to strong influence of the carbon fiber. However, since the influence of the carbon fiber is weak in the direction perpendicular to the carbon fiber, the thermal expansion coefficient in the perpendicular direction is relatively large due to the strong influence of the matrix resin (column 5, lines 5-58).

Griner discloses a rotary dough-sheet cutter (Figs. 1, 3, 5-7 and 9). Cylindrical steel casting 60 is drilled and tapped to provide circumferential, equidistantly spaced holes 66. Holes 66 also form an arrangement 67 consisting of two diagonally opposed holes 66. Cutter rings 63, which are made of steel, are spaced equidistantly from each other on casting 60 and each ring is arranged to lie midway between adjacent groups of circumferentially arranged holes 67. A cutter bar 68 is formed in a manner, which permits the notches 70 to be seated transversely in recesses 65 of cutter ring 63 (column 6, lines 22-38).

In contrast, claim 23 recites in part:

said fiber-reinforced plastic having a plurality of fibers that are substantially oriented in said circumferential direction.

(Emphasis added). Applicants submit that such an invention is neither taught, disclosed nor suggested by Kimura et al., Griner or any of the other cited references, alone or in combination and has distinct advantages thereover.

Kimura et al. disclose a method of manufacturing a cylindrical part from a fiber reinforced plastic composite material having carbon fiber reinforced materials laminated separately by several layers around a forming mandrel having a slight taper to facilitate the removal of the cylindrical parts from the mandrel after heat curing. Griner discloses a rotary dough-sheet cutter having a cutter bar that is formed in a manner which permits the notches therein to be seated transversely to recesses of a cutter ring. The cutter rings of Griner are spaced equidistantly from each other on a casting and each ring is arranged to lie midway between adjacent groups of circumferentially arranged holes. The rings are aligned so that the cutter bar and the notches therein interact to comprise the assembly. Neither of the cited references disclose that the orientation of fibers are substantially in a circumferential direction. In fact quite to the contrary Kimura et al. teaches an orientation of fibers being in the laminating direction of the plastic composite material. The laminating direction is described as the angle Θ and is shown in Fig. 3

as +17° and -17° (see column 6, lines 1-4). When this plastic composite material is wound as taught by Kimura et al., it is wound around a cylindrical form in the laminating direction which orients the fibers primarily in the direction in which it is wound. This direction is substantially perpendicular to the direction of the fibers contained in the claim, which indicates that the plurality of fibers are oriented in a circumferential direction. The use of the word 'circumferentially' was originally suggested by the Examiner and is understood to mean in an outwardly direction, which is contrary to the orientation of the fibers in Kimura et al. Therefore, neither Kimura et al., Griner or any of the other cited references disclose, teach or suggest a fiber-reinforced plastic having a plurality of fibers that are substantially oriented in a circumferential direction, as recited in claim 23.

Advantages of the present invention include a resulting through-flow cylinder which is more resistant to high temperatures and thermal shock while at the same time being cost effective to manufacture. This is particularly important due to the changes of temperature that that through-flow cylinder experiences during operation. For all of the foregoing reasons, Applicants submit that claim 23, and claims 24-34 depending therefrom, are now in condition for allowance, which is hereby respectfully requested.

In further contrast, claim 47 recites in part:

said fiber-reinforced plastic having a plurality of fibers that are substantially oriented in said circumferential direction.

(Emphasis added). Applicants submit that such an invention is neither taught, disclosed nor suggested by Kimura et al., Griner or any of the other cited references, alone or in combination and has distinct advantages thereover.

Kimura et al. disclose a method of manufacturing a cylindrical part from a fiber reinforced plastic composite material having carbon fiber reinforced materials laminated separately by several layers around a forming mandrel having a slight taper to facilitate the removal of the

cylindrical parts from the mandrel after heat curing. Griner discloses a rotary dough-sheet cutter having a cutter bar that is formed in a manner which permits the notches therein to be seated transversely to recesses of a cutter ring. The cutter rings of Griner are spaced equidistantly from each other on a casting and each ring is arranged to lie midway between adjacent groups of circumferentially arranged holes. The rings are aligned so that the cutter bar and the notches therein interact to comprise the assembly. Neither of the cited references disclose that the orientation of fibers are substantially in a circumferential direction. In fact quite to the contrary Kimura et al. teaches an orientation of fibers being in the laminating direction of the plastic composite material. The laminating direction is described as the angle Θ and is shown in Fig. 3 as $+17^\circ$ and -17° (see column 6, lines 1-4). When this plastic composite material is wound as taught by Kimura et al., it is wound around a cylindrical form in the laminating direction which orients the fibers primarily in the direction in which it is wound. This direction is substantially perpendicular to the direction of the fibers contained in the claim, which indicates that the plurality of fibers are oriented in a circumferential direction. The use of the word 'circumferentially' was originally suggested by the Examiner and is understood to mean in an outwardly direction, which is contrary to the orientation of the fibers in Kimura et al. Therefore, neither Kimura et al., Griner or any of the other cited references disclose, teach or suggest a fiber-reinforced plastic having a plurality of fibers that are substantially oriented in a circumferential direction, as recited in claim 47.

Advantages of the present invention include a resulting through-flow cylinder which is more resistant to high temperatures and thermal shock while at the same time being cost effective to manufacture. This is particularly important due to the changes of temperature that that through-flow cylinder experiences during operation. For all of the foregoing reasons, Applicants

submit that claim 47, and claims 48-50 depending therefrom, are now in condition for allowance, which is hereby respectfully requested.

Applicants thank the Examiner for the further indication that claims 19-22 remain allowed.

For the foregoing reasons, Applicants submit that no combination of the cited references teaches, discloses or suggests the subject matter of the amended claims. The pending claims are therefore in condition for allowance, and Applicants respectfully request withdrawal of all rejections and allowance of the claims.

In the event Applicants have overlooked the need for an extension of time, an additional extension of time, payment of fee, or additional payment of fee, Applicants hereby conditionally petition therefor and authorizes that any charges be made to Deposit Account No. 20-0095, TAYLOR & AUST, P.C.

Should any question concerning any of the foregoing arise, the Examiner is invited to telephone the undersigned at (260) 897-3400.

Respectfully submitted,

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